1/pats

SPECIFICATION

Cr-BASED ALLOY HAVING AN EXCELLENT STRENGTH-DUCTILITY BALANCE AT HIGH TEMPERATURE

TECHNICAL FIELD

This invention relates to a Cr-based alloy having an excellent strength-ductility balance at high temperatures (not lower than 1000°C, particularly super-high temperature zone of not lower than 1050°C).

BACKGROUND ART

With the advance of techniques in recent industrial and manufacturing fields and the rise of interest in environmental problem, it is strongly demanded to develop metallic materials having high strength and ductility at higher temperatures, particularly a high temperature zone of not lower than 1000°C.

Incidentally, high-temperature materials used from the old time were mainly Ni-based, Cr-based and Co-based alloys. For example, JP-A-55-154542 proposes Ni-based alloy comprising Cr: 20~35 wt%, Si: 1~8 wt% and C: 1.7~3.5 wt% and forming M_7C_3 type carbide, and also JP-A-55-154542 proposes Ni-Co-Cr based alloy comprising Ni: 20~47 wt%, Co: 6~35 wt%, Cr: 18~36 wt%, C: 0.6~2.5 wt% and Si: 0.5~2.5 wt%. However, all of these alloys could be practically used up to only a temperature of about 500°C. And also, these alloys containing a greater amount of Ni or Co have many problems that the cost of the material itself is very expensive and the thermal expansion coefficient is high.

A Cr-based alloy is hopeful as a high-temperature material being cheaper than Ni- or Co-based alloy and small in the thermal expansion coefficient. For example, JP-A-11-80902 proposes a high-Cr alloy containing C: 0.5~1.5 wt%, Si: 1.0~4.0 wt%, Mn: 0.5~2.0 wt% and Cr: 35~60 wt% and nhancing a r sistance to rosion and corrosion at a higher

comprising Cr: not 1 ss than 60 mass%, C+N: not mor than 20 mass ppm, S: not mor than 20 mass ppm, O: not mor than 100 mass ppm, O as an oxide: not more than 50 mass ppm, and the remainder being Fe and inevitable impurities.

BRIEF DESCRIPTION OF DRAWING

Fig. 1 is a graph showing a relation between strength-ductility balance at 1100°C and C+N amount.

BEST MODE FOR CARRYING OUT THE INVENTION

Firstly, there is described an experiment arriving at the invention.

Various Cr-based alloys containing 65 mass% of Cr are produced by changing purities of starting materials and melting conditions and shaped into rod-shaped specimens of 25 mm by hot forging. In this case, hot forging → working → reheating → hot forging are repeated with respect to alloys hardly working into a rod because of poor workability. These rod-shaped specimens are heated to 1250°C and water-cooled, from which round specimens of 6.5 mm in diameter and 120 mm in length are cut out. The strength (tensile strength) and ductility (reduction of cross section) at 1100°C are measured by using these round specimens by means of a high-temperature tensile testing machine of direct current system (Greeble testing machine).

In Fig. 1 is shown an influence of C+N amount upon strength-ductility balance (product of reduction of cross section RA by tensile strength TS) at a high temperature. From Fig. 1, it is understood that it is required to only decrease the C+N amount but also control S amount and O amount in order to provide RA × TS $\geqq$ 10000 (%·MPa) as a good region of strength-ductility balance at a high temperature zone. The invention is accomplished based on such a knowledge.

Th reason why the components according to the invention ar r stricted to th abov ranges is d scrib d